

TRACKING PROGRESS TOWARDS ECOSYSTEM BASED FISHERIES MANAGEMENT

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INTRODUCTION

It is clear that among science, management, and stakeholder communities, consensus is emerging regarding the need to move from single species to ecosystem based fisheries management. However, this statement remarkably understates the difficulties involved in charting the evolutionary path towards this goal. One of the most easily identifiable problems is, at once, institutional and philosophical in nature; as it requires bridging gaps between ecosystem science, fisheries management plans, fisheries management agencies, and other agencies that formulate and enforce policies on pollution, land use, transportation, and other activities that influence ecosystem components and processes critical to the health and productivity of exploited species.

As the Chesapeake Bay Program has recently learned, the vitality of major efforts towards restoration and management of ecosystems and ecological resources is dependant upon clearly articulated goals and the ability to accurately, transparently, and quantitatively track progress towards those goals. Analogously, momentum towards implementing ecosystem based fisheries management, which will require changes to institutional missions, philosophies, and responsibilities, will prove unsustainable without a procedure or tool that can accommodate the complexities involved in tracking our 'progress in flight' as we take this leap from single species based management. This paper describes the strategies employed to overcome obstacles in formulating a tracking tool that is now used to simultaneously track the restoration efforts to restore five very differently managed fisheries that have been the primary focus of the Program's efforts since its 1984 inception.

BACKGROUND

On July 18, 2004, a Washington Post article claimed that the Chesapeake Bay Program (CBP) had, "significantly overstated" the state-federal partnership's progress towards reducing Bay pollution. The publication of this article shined light on critical flaws in the Chesapeake Bay Program's progress assessment, reporting, and communication programs, which lead to a Government Accountability Office (GAO) audit of the Bay Program because. In October of 2005, the GAO responded with a report entitled, CHESAPEAKE BAY PROGRAM: Improved Strategies Are Needed to Better Assess, Report, and Manage Restoration Progress. One of the key findings of this report was that, *"Despite having over 100 measures, the Bay Program lacks an integrated approach... For example, while the Bay Program has measures to track crab, oyster, and rockfish populations, it does not have an approach for integrating the results of these measures to assess progress"*.

Anticipating the GAO's findings, by November 2004 the Bay Program had already begun to overhaul its entire approach to formulating indicators and communicating progress towards achieving its goals. Its new indicators framework feature objective, verifiable, and quantitative indicators capable of addressing Chesapeake Bay ecosystem health, restoration efforts, and ecosystem stressors.

In parallel with this criticism of the Bay Program's indicator and "State of the Bay" reports, the Bay Program was also acknowledging that their communication and progress reporting had been disproportionately focused on water quality conditions relative to those of living resources. Also, a "keystone commitment" of the CBP, as outlined in the partners' Chesapeake Bay 2000 Agreement is to, "*revise and implement existing fisheries management plans to incorporate ecological, social and economic considerations, multispecies fisheries management and ecosystem approaches.*" Therefore, the CBP felt that accurately depicting the effort towards effective management of key Chesapeake fisheries was an essential component of their first annual Health and Restoration Assessment Report, which was to document progress achieved by the end of 2005 (<http://www.chesapeakebay.net/assess/>).

METHODS

The five key or indicator fishery species that the CBP decided to focus its communication efforts on are striped bass (*Morone saxatilis*), the Atlantic oyster (*Crassostrea virginica*), Atlantic Menhaden (*Brevoortia tyrannus*), American shad (*Alosa sapidissima*) and blue crab (*Callinectes sapidus*). In framing the conceptual approach to formulate a common index capable of tracking the progress towards effectively managing these species, an initial difficulty arose in distinguishing between measuring stock status and measuring efforts made towards effective management. While it was clear that significant and successful efforts had been made to rebuild the striped bass population (as evidenced by its 'restored' status as declared by the Atlantic States Marine Fisheries Commission), significant efforts to protect and restore the Atlantic oyster and American shad in Chesapeake Bay have not been successful: abundance of these species remain near historic lows within the Bay. Questions arose as to whether a moratorium for shad should be judged as progress towards effective management. While the moratorium for striped bass has been judged as a success, because it appears to have contributed to the recovery of that stock, an argument could be made that the shad moratorium, in contrast, was put in place to compensate for the policies of previous decades, which proved ineffective in preventing the continued and pronounced decline in that stock. Similarly, how should stocking and restoration efforts for the oyster, which have not resulted in halting the species' decline in Chesapeake Bay, be reflected in the oyster management effort index score (i.e. as points or demerits)?

The apparent problems, illustrated in the examples above, were avoided by evaluating management progress towards practicing state-of-the-art single species management techniques, while also quantifying progress towards the CBP goals of moving towards multispecies and ecosystem based management. This allowed for the differentiation between effective fisheries management efforts and stock status, which sometimes does not respond to good faith efforts to restore a stock through time tested and well conceived

regulatory actions. This conceptual approach recognizes three steps in the evolution to ecosystem based fisheries management:

- (1) Single species fisheries management (SSFM);
- (2) SSFM with multispecies management considerations;
- (3) Ecosystem based fisheries management (EBFM).

It was decided that the index should be based upon a scale of 0-100: a decision that ensured an index scoring consistency across the entire CBP indicator and communication program redesign. Forty-five points (i.e. percentage points) can be awarded within the single species fisheries management category. This relatively large value was assigned to the SSFM category because; SSFM is the principal approach currently available to protect and restore fisheries, it has proven track record (e.g. striped bass/blue crab in Chesapeake Bay), and it is the foundation of both multispecies and ecosystem based fisheries management. A total of 20 points can be awarded to the second category of fisheries management approaches; SSFM with multispecies management considerations. Fewer points are allocated to this category because planning, recommending and implementing management related to biological and technical interactions is a small incremental step towards effective fisheries management relative to both SSFM and EBFM. A total of 35 points are allocated to EBFM in recognition that this is a significant step to take, but is reliant on implementing both SSFM and multispecies management.

Total points awarded within each of the three major fisheries management categories depend upon points awarded to their respective subcategories. For each of these subcategories, a rationale for point distribution is provided which is based upon the premise that points should be awarded based upon the potential efficacy of any management action and according to the estimated effort required to plan and implement any action (Fig. 1). Figure 2 provides a scoring example based upon the SSFM category for Atlantic menhaden.

Fisheries management approach	Maximum points	Rationale for number of points
1) Single Species Fisheries Management (SSFMP)	(45)	
a) Implement single species fisheries management plan (SSFMP) based upon traditional regulatory tools (i.e. size limits, season limits, harvest caps)	15	Large number of points allocated in recognition that the fishery is being regulated, even if it may not be through an informed and responsive approach based on reference points and thresholds.
b) Define biological reference points (BRP) and associated targets and thresholds to inform SSFMP decisions.	10	Average number points allocated in recognition that significant effort required to define the biological reference points and thresholds, but without the implementation this does not lead to improved fisheries management.
c) Formally establish that exceeding the biological reference point threshold will trigger: (i) a full scale assessment if necessary; and (ii) lead to corrective management action.	20	Large number of points in recognition that management action will be taken if threshold exceeded, and that the management action will be based on the SSFMP, reference points and associated thresholds and targets.
2) SSFM plan with multispecies management considerations	(20)	
a) Identify pertinent biological interactions (e.g. predator-prey interactions) and provide appropriate management recommendations. Recommendations peer reviewed and adopted or written into plans.	5	Few points allocated in recognition that significant effort is required to identify biological interactions and make appropriate management recommendations, but without implementation this does not lead to improved fisheries management.
b) Identify technical interactions (e.g. unintended mortality of non-targeted species or gear-derived habitat degradation) and provide appropriate management recommendations. Recommendations peer reviewed and adopted or written into plans.	5	Few points allocated in recognition that significant effort is required to identify technical interactions and make appropriate management recommendations, but without implementation this does not lead to improved fisheries management.
c) Implement multispecies management recommendations within SSFMP or manage multi-species fishery complex utilizing a multispecies plan.	10	Average number of points allocated in recognition that management action is being implemented, and based on recommendations provided.
3) Ecosystem Based Fisheries Management (EBFM)	(35)	
a) Restore key ecosystem components impacting life cycle of subject species within the CBP restoration framework (e.g. habitat, water quality).	10	Average number of points allocated in recognition that restoration efforts are being conducted, but not in an EBFM framework.
b) Develop an ecosystem based fisheries management plan (EBFMP) and provide appropriate management recommendations.	5	Few points allocated to recognize that substantial effort is required to produce these plans, but unless they are implemented this does not lead to improved fisheries management.
c) Implement an EBFM plan;	15	Large number of points allocated in recognition the EBFMP has been implemented.
d) Assess effectiveness of the EBFMP and take appropriate action	5	Few points allocated to recognize the effort required to assess the effectiveness of the EBFMP through methods such as stock assessment.

Figure 1: Summary of fisheries management index framework, including maximum point potentials.

proportion awarded	Allocated points	Rationale	Supporting documentation
1.00	15	SSFMP in place. Since 1970's important biological reference points have not been exceeded. Annual harvest cap of 105,783 metric tons to start in 2006.	Atlantic States Marine Fisheries Commission (ASMFC) (October 2005) ADDENDUM II TO AMENDMENT 1 TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR ATLANTIC MENHADEN
1.00	10	Biological reference points, targets and thresholds defined	1) ASMFC ADDENDUM I TO AMENDMENT I TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR ATLANTIC MENHADEN ASMFC. August 2004: 2) ASMFC 2004B. Atlantic Menhaden Stock Assessment for Peer Review. Atlantic States Marine Fisheries Commission, Stock Assessment Report No. 04-01. 145p.
0.75	15	Exceedance of threshold triggers stock assessment rather than management action. Detailed assessment may lead to management action recommendations.	1) ASMFC Commission ADDENDUM I TO AMENDMENT I TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR ATLANTIC MENHADEN ASMFC. August 2004:

Figure 2: Scoring for the SSFM category and associated explanation for the Atlantic Menhaden index formulation (categories 2 and 3 omitted).

MANAGEMENT IMPLICATIONS

As state and federal agencies move towards ecosystem based management, the process will not necessarily be a gradual evolution from single species management to ecosystem based management. Rather it will rely on current single species management principles

and will migrate towards formal interactions between single species planning as multispecies management principles are applied (Fig 3). Ecosystem based fisheries management will only occur as agencies that traditionally make policy decisions over issues such as land use, zoning, and habitat modifications, are informed, responsible for, and account for how those policy decisions impact our ability to effectively manage exploited species. As occurred in the Chesapeake Bay region, the same scientists, politicians, stakeholders and administrators now advocating for the move towards ecosystem based EBFM will demand accountability and progress. This will be possible with careful development of quantitative indices of progress, as described in this paper, that can simultaneously track developments in SSFM, and towards the increasingly sophisticated multispecies, and ecosystem based management approaches. In order for such an index to be accurate, effective, and accepted, both its development and continued improvement need to be punctuated by many constructive meetings and discussions between the index authors and various scientists, management agency administrators, practicing managers, and communication experts. Further, the index grading process should always be open to public comment. Adopting this strategy towards the development of similar tracking and communication tools will improve accountability, and therefore facilitate and promote successful evolution from single species to ecosystem based fisheries management.

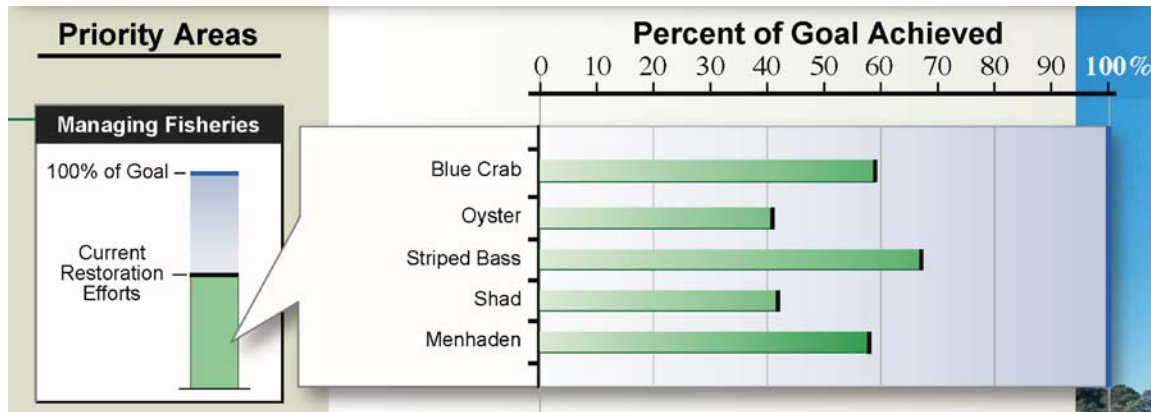


Figure 3: Final results when summarizing scores for each species across all categories.

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